

Draft list for a cryo box, cryostat, or spool piece specification

Tom Peterson

December 3, 2003

Edited based on our December 3, 2003, meeting.

Attendees: Tom Nicol, Tom Page, Roger Rabehl, Deepak Chichili, John Tompkins, Mike Tartaglia, Peter Garbincius, Arkadiy Klebaner, Jay Theilacker, Tom Peterson

1. System layout, P&ID. Jay and Arkadiy presented a schematic of the cryogenic strings on each side of C0.
2. What is the maximum allowable working pressure (MAWP) of our new devices? (We must set that and follow FESHM 5031 and other FESHM rules for these new devices.) We agreed on 200 psig single-phase, 50 psig 2-phase. We did not discuss it, but I suggest 100 psig nitrogen.
3. Heat loads (budgeted or estimated). I suggested 5 W per new device, but in some cases 10 W may be more realistic. We will revise our estimates. Each 5 kA HTS lead consumes 0.025 g/sec (0.7 l/hr) helium and 0.8 g/sec (3.6 l/hr) nitrogen.
4. Cooling scheme, single phase recooling, 2-phase flow. Remember that 2-phase should flow in and out the top; liquid drops out and fills the 2-phase volume up to the exit port. We would like recooling wherever practical in spools as well as 2-phase cooling in the quads.
5. Pipe and channel sizes. Perhaps it is more useful to specify an allowable pressure drop under nominal conditions. In 1989 we listed 0.005 psid single phase, 0.030 psid 2-phase per pass through a device, based on 4.7 K, 16 psig single phase and 5 psig 2-phase flow at 30 g/sec; we agreed that these numbers are a good starting

point. We still need a nitrogen pressure drop specification.

6. Interconnects and left-right configurations. Tevatron interconnect components and configuration will be used wherever possible. The pipe crossing necessitated by turning around the inner triplet but not turning around Tevatron components occurs in the C1-side inner triplet feedbox, since the two feedboxes are unique, anyway.
7. Quench valve locations (Do all spools require all 3 Kautzky valves?) The answer is yes, all spools require all 3 Kautzky valves (single-phase, 2-phase, nitrogen). For the inner triplet, the feed box will include reliefs for the single-phase return pipe (thus serving the IP end of Q1) and the single-phase supply line (thus serving the non-IP end of Q3). Two more relief ports are needed, at each end of Q2.
8. Miscellaneous features: vacuum break locations (every spool piece must have an insulating vacuum break), re cooler locations, safety lead locations (presently listed as every other spool), current lead locations, BPMs, IR feed box features, start an instrumentation list, etc. Some of these are already listed in Mike's spreadsheet. Let's add more columns. I suggest columns for corrector leads, helium lead flow, nitrogen lead flow, and estimated heat to the 4.5 K level. We would like to compare the new C1 and B4 cryo heat loads with the present ones, highlighting new loads. BD will incorporate our heat load estimates into their temperature model for the cryo strings.